CHAPTER 4

ENVIRONMENTAL CONSEQUENCES

4.0 INTRODUCTION

This chapter provides an analysis of the potential environmental consequences that could result from implementation of the proposed Lower Bush Creek Pilot Exploratory Coal Bed Methane Project for development of federal minerals associated with 20 exploratory and two injection well locations, access roads and associated facilities. Two alternatives including the Proposed Action and the No Action (denial of Proposed Action) are analyzed.

Impact significance criteria are presented for each affected resource. The criteria are based on current regulatory standards, scientific and environmental documentation, or professional judgement.

Measures proposed by the applicant that would avoid or reduce impacts have been identified in Chapter 2, Section 2.1.9. The following impact assessment takes these measures into consideration. Any additional opportunities to mitigate impacts beyond the practices committed to in Chapter 2, are presented in this chapter under the mitigation summary for each resource. Such measures are designed to further reduce or avoid unnecessary or undue impacts.

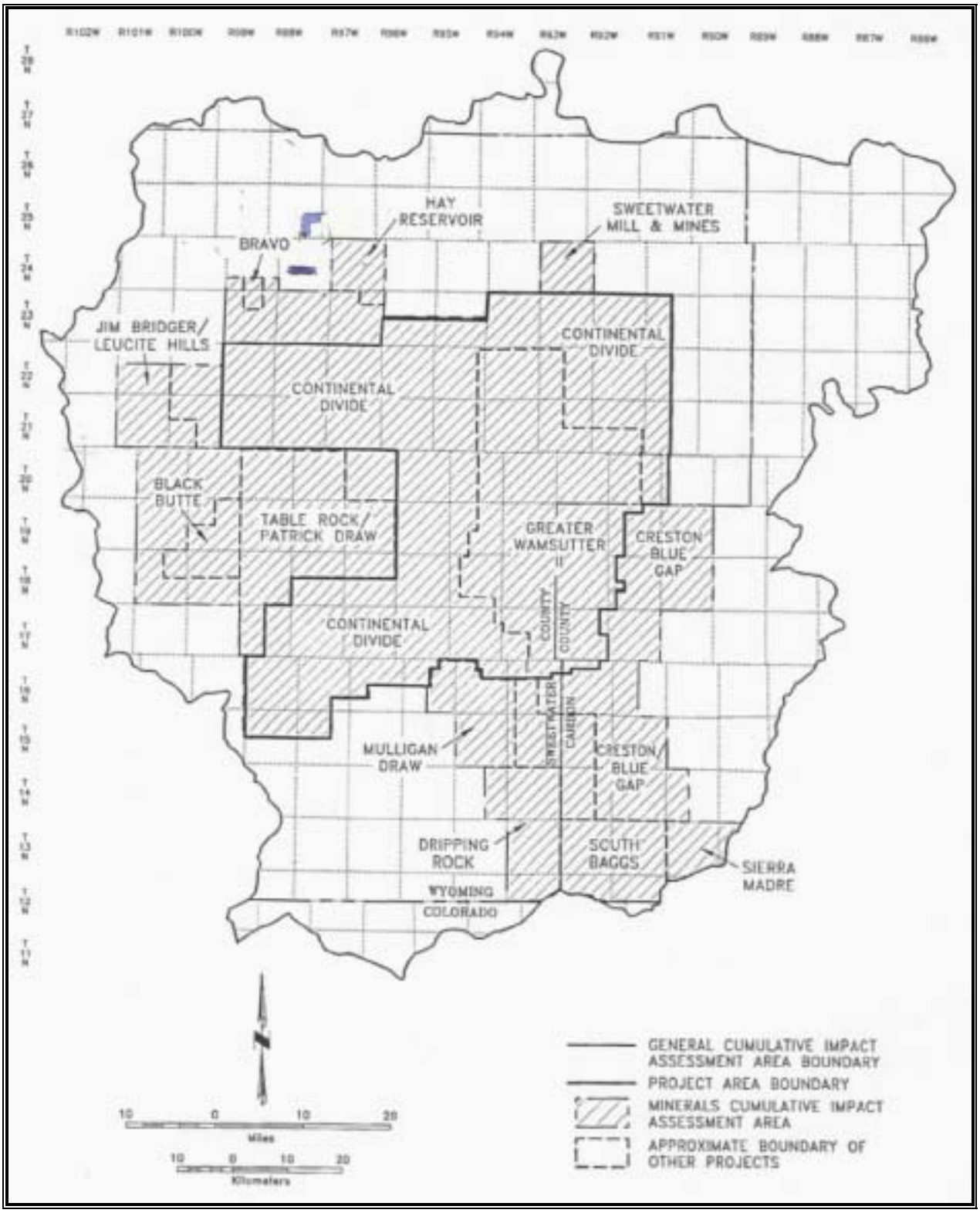
The analysis of the potential environmental consequences addresses the direct, indirect, and cumulative effects as a result of the Alternatives. This analysis tiers to and incorporates by reference the cumulative impact analysis for the Continental Divide/Wamsutter II Natural Gas Project Environmental Impact Statement (CD/WII) (see individual resource discussions in Chapter 4; document available at the Rock Springs Field Office). The cumulative analysis for the CD/WII included a reasonably foreseeable development of 850 exploratory wells and associated facilities within the general cumulative impact analysis area (the area outside of the minerals cumulative impact analysis area; see Figure 4.1). The proposed project lies within the general cumulative impact assessment area.

The air quality analysis found in this document tiers to and incorporates by reference the Pinedale Anticline Oil and Gas Exploration and Development Project Environmental Impact Statement (1999a [Chapter 5; document can be found via the internet at http://www.wy.blm.gov/nepa/pfodocs/anticline/index.htm]).

4.1 GEOLOGY/MINERALS/PALEONTOLOGY

No standards have been identified for determining the significance threshold for geology or minerals. Damage, destruction, or improper collection of scientifically important paleotonological resources

Figure 4.1 CD/WII General and Mineral Cumulative Impact Assessment Areas in Relation to the Project Area



could be considered significant if not properly mitigated or indirectly lost or destroyed due to private collection or vandalism.

4.1.1 Proposed Action

No direct, indirect, or cumulative impacts are expected on geology from the Proposed Action. As discussed in Chapter 3, no major landslides or fault zones have been mapped within the analysis area. The potential for damage from disruption of project facilities from seismic activity is minimal to non-existent over the life of the project.

Drilling of the wells may result in the determination of commercial production potential of CBM resources. This determination would likely lead to further exploration and development. Production of CBM would result in the depletion of an in-place resource and should testing prove economically viable quantities of natural gas are present, it would be expected that further exploration and development would be proposed. Any such proposal would be analyzed at that time. If no commercially viable CBM resources are discovered, then additional exploratory wells may or may not be drilled, depending on the information obtained during drilling of the proposed wells. No other mineral resources would be impacted by implementation of the Proposed Action.

No effect to one of the known fossil sites is anticipated as the site is not directly or indirectly affected by the Proposed Action. Effects to the other known site are unknown as the site has not been fully investigated. Construction excavation associated with the development of access roads, well pads, or reserve pits located on well pads could result in uncovering scientifically important fossils which would be an adverse impact if mitigation were not applied.

4.1.2 MITIGATION

Implementation of the committed practices found in Chapter 2, Sections 2.1.9.2, (soils) and 2.1.9.3 (water resources) would avoid impacts on the surface geologic resources. Implementation of these measures and adherence to federal and state rules and regulations regarding drilling, testing, and completion procedures would avoid or reduce effects on the subsurface geologic environment.

With the mitigation outlined below all known and any unknown paleontological resources uncovered during construction would be protected and any potential impacts minimized.

- The proponent should immediately contact the BLM Field Manager (authorized officer) if any paleontological resources or fossils are discovered as a result of operations. All activities would be suspended in the vicinity of such discovery until notified to proceed by the authorized officer. The authorized officer would evaluate, or would have evaluated, such discoveries not later than 5 working days after being notified, and would determine what action would be taken with respect to such discoveries. The decision as to the appropriate measures to mitigate adverse affects to significant paleontological resources would be made by the authorized officer after consulting with BLM's regional Paleontologist. The proponent may be responsible for the cost of any investigation necessary for the evaluation and for any mitigative measures.

- Should paleontological materials be found during project implementation, all activities within a 100 ft radius should cease and BLM's authorized office notified immediately.

- During processing of each APDs or ROWs, BLM should determine whether a paleontological survey is required.

- The proponent should initiate a worker education of important fossil remains and restrictions on collection of paleontological resources without a permit. The proponent should be responsible for informing all persons associated with the project that they could be subject to prosecution for damaging, altering, excavating, or removing any vertebrate fossil objects on site. Should vertebrate fossil materials be discovered, the operator is to suspend all operations that further disturb such materials and contact the Authorized Officer immediately. Operations would not resume until written authorization to proceed is issued by the Authorized Officer.

- The proponent should be responsible for the cost of any mitigation required by the Authorized Officer. The Authorized Officer would provide technical and procedural guidelines for the conduct of mitigation. Upon verification from the Authorized Officer that the required mitigation has been completed, the operator should be allowed to resume operations.

4.1.3 NO ACTION

Under the No Action Alternative, the lease holder would be denied approval to explore and test for economically viable CBM gas on their federal oil and gas leases. Information on CBM reservoirs in this area would remain unknown and the collective knowledge base would not increase at this time. Selection of the No Action alternative would not preclude another exploration and/or development drilling program from being proposed in the same area or elsewhere.

4.2 AIR QUALITY

Standards for healthy public rangelands requires management actions or use authorizations to comply with all federal and state air quality laws, rules, regulations, and standards. Impacts which exceed this standard could be considered significant.

4.2.1 PROPOSED ACTION

Air quality modeling was done for the Pinedale Anticline Oil and Gas Exploration and Development Project and the corresponding EIS Technical Report (1999b) included emissions from the project. This modeling also included a cumulative analysis of emissions from projected development of 7,211 wells in the surrounding areas of the model domain of southwestern Wyoming, north-eastern Utah, and northwestern Colorado. Impacts of both near-field and far-field impacts were considered. The Proposed Action falls within the 7,211 wells analyzed. The results of the air quality modeling

analysis are incorporated by reference. The result of the study found that the predicted emissions from cumulative sources were in compliance with the NAAQS and WAAQS for all pollutants.

Construction emissions would include PM_{10}, SO_2, NO_x, CO, and VOCs from ground-clearing, heavy equipment use, drilling and completion activities, as well as the construction of access roads. Construction emissions are temporary and would occur in isolation, without interacting with adjacent wells.

The small number of exploratory wells and facilities included in the Proposed Action would generate a near-undetectable amount of air pollutants. The engines proposed to be used on the pumping units are among the most efficient on the market. The limited number of vehicles over the short time period of the exploration project would add a minor amount of emissions to the atmosphere and would be considered temporary. These temporary effects on air quality could occur in the immediate vicinity of project activities due to loose road dust and exhausts from vehicles and equipment. These effects would be local and would be widely dispersed by prevailing winds. The effects on air quality would be minimized through the application of dust abatement practices, including adherence to speed limits, and best available technology for engines.

4.2.2 MITIGATION

See Chapter 2, Section 2.1.9.1, for committed practices to protect air quality.

The WDEQ-AQD requested the addition of the mitigation found below to assure appropriate state permits are acquired for any temporary or permanent equipment used in association with this project. With application of this measure, state requirements for permitting for emissions would be met.

- The proponent would seek appropriate permits and follow state protocol for approval of all on-site temporary or permanent equipment used in association with this project from the Wyoming Department of Environmental Quality, Air Quality Division.

4.2.3 NO ACTION

Under the No Action Alternative, no change in the current situation would be expected.

4.3 SOILS

Standards for healthy public rangelands require soils to be stable and allow for water infiltration to provide for optimal plant growth and minimal surface runoff. Impacts which exceed this standard could be considered significant.

4.3.1 PROPOSED ACTION

Soil productivity would be impacted at locations where well sites, facilities, and access roads are constructed. An estimated maximum of 85 acres would be affected by surface-disturbing activities.

Stockpiled topsoil and other disturbed areas, particularly on sandy soils, could be subject to wind erosion and runoff during storm events until stabilized by a vegetative cover. Practices that Kennedy has committed to, as detailed in Chapter 2, and existing regulatory requirements would help conserve soil resources through best management practices for erosion control and revegetation in disturbed areas.

Kennedy's experience in the Powder River Basin has convinced them that special purpose roads work well for CBM exploration and results in less initial disturbance and resource damage. BLM's experience in southwestern Wyoming is that potential direct and indirect impacts to soils due to year-round use of special purpose roads could result in soil damage as a result of traffic on unconstructed roads (without a crown/ditch design element) in the form of rutting and possibly gully development which leads to water and wind erosion. Use of drilling mud (bentonite is used as a lubricant during drilling activity) as a binder with native soils could prove problematic. Bentonite expands when wet and use of this material to build up the driving surface (plating) would result in slippery driving conditions. Cohesiveness of soils in the analysis area is rated as low, making them susceptible to erosion when disturbed. These soils therefore lack strength to carry heavy traffic. Ruts in the travel-way cause drivers to avoid those areas and create new disturbance. Ruts also act as conduits for runoff water, concentrating the flow and increasing the erosiveness of the runoff.

Vehicle travel on unprotected dry surfaces loosens and pulverizes what little soil structure and cohesion that exists in the soils found in southwest Wyoming. The result is a powder-like duff that is highly susceptible to wind erosion and compaction when wetted. As is found on wet, muddy areas, drivers frequently avoid these soft spots by driving around them and creating new, uncontrolled disturbance. Wind eroded roads often become below grade (lower than the surrounding surfaces) as a result of scour and displacement. These surfaces then become flumes for runoff water.

If use of special purpose roads were allowed without a mechanism for monitoring and mitigating any resource damage, use could result in adverse impacts.

4.3.2 MITIGATION

See Chapter 2, Section 2.1.9.2, for committed practices.

With application of the measures found below, impacts from testing of special purpose roads would be within acceptable limits and any resource damage repaired before it becomes severe.

- BLM could allow the proponent to test use of special purpose roads to confirm likely impacts. All special purpose roads would be surveyed. BLM would monitor construction and use of these roads. If during monitoring, damage to soils or other resource values becomes evident, the proponent would be required to stop activity, engineer the roadway, and construct the road to BLM road standards in accordance with RMP mandates. If resource damage occurred and rectifying the damage necessitated disturbing an area greater than that analyzed or approved, the project or component of the project would be halted while further environmental study occurs.

- The proposed special purpose road, located between the existing upgraded road and the Federal 23-22 (Central Sweetwater pod) would be upgraded to a resource road as this area will serve as a loop road for the pod but would result in an additional 17 acres of disturbance.

- All resource roads would be designed by or under the direction of a licensed engineer in accordance with RMP mandates.

- If development of ruts results in unnecessary or undue damage to soils or other resources, the proponent would be required to re-construct the special purpose road to a higher road standard.

- Drilling mud should not be used for road plating, surfacing, or development.

4.3.4 NO ACTION

No effects on soils would be expected beyond the current situation.

4.4 WATER RESOURCES

Standards for healthy public rangelands require actions to comply with Wyoming State water quality standards. Impacts which exceed this standard could be considered significant.

4.4.1 PROPOSED ACTION

With the use of proper well pad construction techniques and drilling practices, and with the implementation of Best Management Practices (BMPs) and applicant committed practices, these standards would be met and no adverse effect on groundwater aquifers and quality would be anticipated under the Proposed Action. Groundwater would be removed from the coal seam aquifers within the Big Red Coal of the Fort Union Formation in order to test CBM production. CBM testing activities likely would lower the hydraulic pressure head in the affected coal seam aquifer. The reduction of hydraulic pressure head in an aquifer also is referred to as drawdown. Relative to the available drawdown within the aquifer, and the extent of the Proposed Action, effect on the coal aquifer is expected to be minimal because this project is designed to test CBM production and reinjection potential. Because testing results would remain unknown until after the project is completed (assuming initial testing proves promising), the effects of groundwater extraction and reinjection should be subject to monitoring of groundwater conditions and findings analyzed prior to any expansion of activities in the area. No ground water wells permitted by the WSEO are known to occur within a mile of the project area. There would be no impacts to existing wells.

CBM exploratory wells would produce water that would be disposed of in two injection wells. The proposed injection targets for each injection well are the sands of the Fort Union Formation, located approximately 4,500 to 6,000 feet below the surface, respectively. Background water quality analyses of the injection horizon currently are not available, but it is anticipated that the CBM

produced water that would be of equal or higher quality compared to the water quality in the injection zone, with regard to class of use as defined by WDEQ-GWD regulations. Injection of the CBM produced water is not expected to result in any deterioration in groundwater quality within the injection horizon due to the depth and expected water quality (must be equal to or worse quality than the produced water. These sands are isolated above and below by competent shale barriers that would prevent the initiation and propagation of fractures through overlying strata to any fresh water zones. The only effect on the injection horizons would consist of an increase in hydraulic head, which would decrease with distance away from the wellbore. In terms of water quantity and quality, the Proposed Action's effect on the injection horizon would be minimal.

The fracture gradient of the beds that overlie and underlie the injection horizons would not be expected to be exceeded, so all injected water would be contained in the injection horizon and would not migrate vertically. For this reason, the injected water is not expected to degrade water quality of any adjacent aquifers.

Water for use in drilling the initial CBM well in the project area would be obtained from a local permitted source and water for drilling the remaining wells would be obtained from the first well drilled. The project would require approximately 600 barrels of water per well for drilling, completion, and well stimulation. This water requirement is relatively small and would not adversely affect existing surface or groundwater sources or rights.

Construction activities would occur over a relatively short period of time. Construction impacts would likely be greatest shortly after the start of the project and would decrease in time due to stabilization, reclamation, and revegetation efforts. The Proposed Action would result in 85 acres of initial disturbance and 29 acres of life-of-project disturbance. Construction disturbance would not be uniformly distributed across the project area, but rather, construction activities would be concentrated within and around the wells. Kennedy would implement BMPs and committed practices to ensure spills of produced water do not occur; therefore, no impact from spills is anticipated.

Potential direct and indirect impacts due to year-round use of "special purpose" roads could result in damage as a result of traffic on unconstructed roads (without a crown/ditch design element) in the form of ruts and possibly overland channelization (gullying) which accelerates water erosion. The use of drilling mud as a road construction material is also problematic. Many drilling muds contain bentonite which expands when wet. Use of this material to build up a driving surface (plating) in low-lying areas where water collects would result in slippery and unsafe driving conditions. Soils found in the area lack the strength to carry heavy traffic; therefore, any rut development not only leads to drive-arounds but acts as conduit for runoff water, concentrating the flow and increasing the erosiveness of the runoff.

Vehicle travel on unprotected dry surfaces loosens and pulverizes existing soil structure and cohesion. The result is a powder-like duff that is highly susceptible to wind erosion and compaction when wetted. Traffic frequently avoids wet, muddy areas by driving around them and creating new uncontrolled disturbance. Wind eroded roads often become below grade (lower than the surrounding surfaces) as a result of scour and displacement. These surfaces then become flumes for runoff water.

If use of special purpose roads were allowed without a mechanism for monitoring and mitigating any resource damage, adverse impacts from use of such roads could occur.

4.4.2 MITIGATION

See Chapter 2, Sections 2.1.9.2, 2.1.9.3, 2.1.9.6, and 2.1.9.7 for committed practices. Additional mitigation for ground water resources has been identified.

- Monitoring of groundwater conditions and findings would be analyzed prior to any expansion of activities in the area.

- Results of water quality testing from reserve pits and injection wells would be submitted to BLM RSFO.

With application of the measures found below, impacts from testing of special purpose roads would be within acceptable limits and any resource damage repaired before it becomes severe.

- Any special purpose roads allowed would be surveyed. BLM would monitor construction and use of these roads. If during monitoring, damage to resource values becomes evident, the proponent would be required to stop activity, engineer the roadway, and construct the road to BLM road standards. If resource damage occurred and rectifying the damage necessitated disturbing an area greater than that analyzed or approved, the project or component of the project would be halted while further environmental study occurs.

- The proposed special purpose road located between the existing upgraded road and the Federal 23-22 (Central Sweetwater pod) would be upgraded to a collector road as this area will serve as a loop road for the pod but would result in an additional 17 acres of disturbance.

- All resource roads would be designed by or under the direction of a licensed engineer in accordance with RMP mandates.

- If development of ruts results in unnecessary or undue damage to soils or other resources, the proponent would be required to re-construct the Special Purpose road to a higher road standard.

- Drilling mud would not be used for road plating, surfacing, or development.

4.4.3 NO ACTION

No additional effects on water resources would be expected to occur beyond the current situation.

4.5 VEGETATION, SPECIAL STATUS PLANT SPECIES, WETLANDS, NOXIOUS WEEDS

Standards for healthy public rangelands require upland vegetation to consist of plant communities appropriate to the site which are resilient, diverse, and able to recover from natural and human disturbance. Impacts which exceed this standard could be considered significant.

4.5.1 PROPOSED ACTION

Implementation of the project would result in the loss of natural vegetation in terms of cover and species composition in areas where well sites, facilities, and access roads would be constructed. An estimated 85 acres would be affected by initial surface-disturbing activities during drilling and testing. To avoid permanent loss of species diversity and vegetative cover, topsoil would be stockpiled, and reclaimed areas would be seeded with site-specific mixes during appropriate planting periods, according to the committed practices detailed in Chapter 2. Life-of-project disturbance would be approximately 29 acres.

Indirect effects would include increased potential for weed invasion, exposure of soils to accelerated erosion, loss of habitats, and changes in visual aesthetics. Use of committed practices described in Chapter 2 during construction, operation, and reclamation activities would minimize effects on vegetation resources. Weed monitoring would occur during drilling, production, and reclamation activities. Weeds found would be eradicated following county control and BLM-approved procedures. To further reduce potential impacts from invasive species, equipment should be washed prior entering the project area. Properly reclaimed areas free of weed species would not cause loss of habitat or change visual aesthetics.

The Wyoming big sagebrush, greasewood, and saltbush cover types that would be disturbed under the project are commonly found across southwest Wyoming. The short-term or long-term loss in acreage described above would not impact the overall abundance and quality of these habitats.

In general, the duration of effects on vegetation in the project area would depend on the time required for natural succession to return disturbed areas to pre-disturbance conditions of diversity (species diversity and structural diversity). Reestablishment of pre-disturbance conditions would be influenced by climatic (growing season, temperature, and precipitation patterns) and edaphic (physical, chemical, and biological soil conditions) factors. This would include the amount and quality of topsoil salvaged, stockpiled, and spread over disturbed areas. If reseeding can not be completed in accordance with Kennedy's proposal of reseeding in the fall, seeding should take place in the early spring. Application of this measure would help assure proper revegetation.

BLM has made a no-effect determination for federally listed threatened or endangered plant species as their habitat is not known to occur in the project area. Wetlands are not expected to be impacted.

4.5.2 MITIGATION

See committed practices in Chapter 2, Sections 2.1.9.2, 2.1.9.3, and 2.1.9.5.

- All equipment would be washed prior to entering the project area in order to prevent or minimize the spread of invasive species.

- If seeding in the fall cannot be done in accordance with Appendix D, seeding would be done in the early spring prior to April 15.

4.5.3 NO ACTION

Under the No Action Alternative, the development of the Proposed Action would not occur. No additional effects on vegetation resources or wetlands would be expected to occur beyond the current situation.

4.6 RANGE RESOURCES AND OTHER LAND USES

Standards for healthy public rangelands require upland vegetation to consist of plant communities appropriate to the site which are resilient, diverse, and able to recover from natural and human disturbance. Impacts which exceed this standard could be considered significant.

4.6.1 PROPOSED ACTION

Anticipated effects on range resources associated with the project are limited to a minimal loss of forage, an increased potential for vehicle/livestock collisions, and an increased potential for the spread of noxious and invasive weeds (discussed above under Vegetation/Wetlands/Noxious Weeds). The project would not be likely to result in noticeable effects on range resources. The area of disturbance (85 acres) represents approximately 5 to 7 AUMs.

Livestock grazing activities would continue during the implementation of the project. Forage in the project area would be reduced slightly during drilling and field development and restored as soon as practical thereafter, except for areas used for road corridors and well facilities, which would remain disturbed throughout the productive life of the project. The increased traffic associated with project activity could correspondingly increase the potential for vehicle/livestock accidents during that period; however, roadways are limited and the grazing area expansive, resulting in decreased likelihood of collisions.

No impacts to other land uses are anticipated as geophysical operations can easily accommodate on-going land use activity. As long as Kennedy Oil restricts operations to their right-of-way, no impact to existing pipelines is expected although holders of existing rights-of-way should be notified when activity is planned within or adjacent to the existing facilities. Kennedy would use certain roads having rights-of-way held by other operators. Kennedy should contribute to any required road maintenance.

4.6.2 MITIGATION

- The proponent sould be required to notify holders of existing rights-of-way or other permits (i.e., grazing) of planned construction, operations, or maintenance activities.

- For the purpose of determining joint maintenance responsibilities, the proponent would make road use plans known to all other authorized users of the road. Any road rights-of-way would include a standard stipulation for joint road maintenance agreement.

4.6.3 NO ACTION

Under the No Action, the development of the Proposed Action would not occur. No additional effects on range resources would be expected to occur beyond the current situation.

4.7 WILDLIFE/SPECIAL STATUS SPECIES

Standards for healthy public rangelands require that such lands are capable of sustaining viable populations and a diversity of native animal species appropriate to that habitat. Those habitats that support threatened, endangered species, species of special concern, or sensitive species would be maintained or enhanced. Impacts which exceed this standard could be considered significant.

4.7.1 PROPOSED ACTION

The effects on wildlife of the proposed project would include displacement of wildlife, loss or temporary disturbance of wildlife habitats, an increase in the potential for collisions between wildlife and motor vehicles, and an increase in the potential for illegal kill, harassment, and disturbance of wildlife due to increased human presence and improved vehicle access. The magnitude of impacts to wildlife resources would depend on a number of factors including the type and duration of disturbance, the species of wildlife present, time of year, and successful implementation of avoidance and mitigation practices. An estimated 85 acres under the Proposed Action would be affected by surface-disturbing project activities. Reclamation following project activities is expected to return most habitats to pre-disturbance conditions over the long term. During construction, the project is expected to be avoided by some resident species.

Disturbances from human activity and traffic would reduce wildlife use of habitats immediately adjacent to these areas by species sensitive to indirect human disturbance (noise and visual disturbance). Wildlife use of these areas would be lowest during the construction phase when human activities are more extensive and localized. Disturbance would decline during the production phase of operations and some animals may become acclimated to equipment, facilities, and infrequent human presence, and may reoccupy habitats near disturbed areas.

The direct disturbance of wildlife habitat in the project area likely would reduce habitat availability and effectiveness for a variety of small mammals, birds, reptiles, amphibians, and their predators.

The initial phases of surface disturbance and increased traffic would potentially result in some direct mortality to small mammals, reptiles, and amphibians. Noise and traffic would displace wildlife from construction areas. An increase in mortality from increased vehicle use of roads in the project area would also be expected.

Due to the relatively high reproduction potential of some of these species and the relatively small amount of habitat disturbed, small mammal and songbird populations should quickly rebound to pre-disturbance levels following reclamation of utility corridors, unused portions of roads, well pads, and wells that prove to be unproductive. No long-term effects on populations of common small mammals and songbirds are expected.

4.7.1.1 BIG GAME

Effects on big game species would include direct loss of habitat and forage, and increased disturbance from activities associated with the project. Disturbance of big game species during the parturition period and on winter range can increase stress and may influence species distribution and productivity (Hayden-Wing 1980, Morgantini and Hudson 1980). No crucial big game winter range or parturition areas have been identified in the project area.

There may also be a potential for an increase in poaching and harassment of big game, particularly during winter. Big game would be expected to demonstrate some avoidance of the area for the life of the project due to an increase in human presence.

Effects on big game are expected to be minimal, as the project area represents less than one percent of pronghorn antelope (migration would not be impeded since no fencing is proposed other than around the reserve pits which is designed to keep animals out), mule deer, or elk winter or year-long range. Any snow removal could impede big game movement if berms were too high or if there were no breaks in the berms. Application of the mitigative measure found below should prevent this potential impact. No long-term habitat loss is expected once reclamation is complete, as big game species are expected to return to the area.

4.7.1.1.1 MITIGATION

See committed practices found in Section 2.1.9.8, Chapter 2 and Appendix B.

- Any snow removal would be done in a manner that would not preclude movement by big game (i.e., no tall berms or regularly spaced breaks in the berms).

4.7.1.2 UPLAND GAME BIRDS

Effects to greater sage-grouse could include direct loss of habitat and forage, and increased disturbance from project related activities. Disturbance of sage-grouse during the nesting and brood-rearing period and on winter concentration areas can increase stress and may influence species distribution. There may also be a potential for increased poaching and harassment or increased predation from raptors using facilities for perching. Greater sage-grouse would be expected to

demonstrate avoidance of the area for the life of the project depending upon the level of human activity and where it occurs in relation to suitable habitat. Noise and human disturbance in the project may lead to lek abandonment and reduced nesting.

Although no active leks are located in the project area, five leks are found within two miles. Although these leks have had little activity the last couple of years there is an abundant quantity of suitable greater sage grouse nesting habitat available. The amount of habitat disturbance should be minimal in proportion to that which is suitable. Sage grouse can be impacted by other activities associated with CBM development, including increased human and pet activity, increased traffic, and predation by birds of prey.

4.7.1.2.1 MITIGATION

The project would be conducted with adherence to committed practices as detailed in Section 2.1.9.8, Chapter 2.

Application of the mitigation measures found below would further reduce potential impacts.

- The GRRMP contains mitigating practices that protect the breeding, nesting and brood-rearing activities of the greater sage-grouse from February 1 to July 31. "No surface occupancy" stipulations apply within a 1/4 mile buffer around active leks. Road use would be limited within 1/4 mile of an active lek between 6:00 pm and 9:00 am February 1 through May 15.

- Construction of structures that could be used for raptor perches would be avoided or mitigated to prevent raptor perching. Exceptions may be granted if the activity would occur in unsuitable sage grouse nesting habitat.

4.7.1.3 RAPTORS

The principal potential effects of implementing the proposal on raptor species would be nest abandonment and/or reproductive failure caused by project-related activities and increased public access, and small, temporary reductions in prey populations for raptors. No active raptor nests were found within the project area during 2002. The only known nest is found at John Hay Reservoir, located over one mile to the north.

There is also potential for impacts to burrowing owls expected to nest in the area. No effects on other breeding raptors are expected, provided avoidance and mitigation measures are followed. Raptors could use facilities as perching sites for hunting resulting in additional impacts to small animals residing in the area. No cumulative effects are expected with the implementation of committed practices and mitigations.

4.7.1.3.1 MITIGATION

The project would be conducted with adherence to committed practices as detailed in Section

2.1.9.8, Chapter 2.

4.7.1.4 THREATENED AND ENDANGERED SPECIES

Black-footed Ferret and Associated White-tailed Prairie Dog Colonies

White-tailed prairie dog colonies provide essential habitat for black-footed ferrets. Ferrets depend almost exclusively on prairie dogs for food, and they depend upon prairie dog burrows for shelter, parturition, and raising young (Hillman and Clark 1980). Prairie dog towns or complexes must be greater than 200 acres and have a burrow density greater than or equal to 8 burrows/acres in order to be considered suitable for black-footed ferrets (Biggins, et al. 1989). Suitable habitat is found in the general area; however, the BLM has made a no effect determination for this action and the FWS concurred. Prairie dogs could be subject to predation by raptors if facilities are used for perching. Anti-perching devices would mitigate any impact.

The proposed water pipeline route which does not follow roads would disturb a white-tailed prairie dog town. To avoid impacts to the town, all proposed pipelines should follow the road or travel way. Road maintenance could result in disturbance to prairie dog towns if it were to occur outside of previously disturbed areas. Keeping disturbance within the permit boundary would protect the town.

Mountain Plover

The presence of prairie dog towns and other suitable habitat indicate that plovers use these areas during breeding and brood-rearing. The potential exists for adverse impacts if protective measures are not adhered to. This species has been observed in the project area. Standard avoidance and mitigation measures in accordance with FWS guidelines should ensure no adverse impact to mountain plovers would occur as long as the measures are adhered to. Based on such mitigation, this action has resulted in a no jeopardy determination, and a may affect, not likely to adversely effect determination should the plover be listed as threatened under the Endangered Species Act.

Bald Eagle

Since neither habitat, nor potential habitat exists within two miles of the project, the Proposed Action would have no effect on bald eagles. No mitigation is required.

4.7.1.4.1 MITIGATION

The project would be conducted with adherence to committed practices as detailed in Section 2.1.9.8, Chapter 2.

Adoption of the following measures would further reduce potential impacts.

- Pipelines sould follow roads or travel ways to avoid disturbance to an existing prairie dog town.

- Should a mountain plover nest, chick, or egg be observed during construction, all work would be stopped within ½ mile and BLM notified immediately. In mountain plover habitat, reclamation seed mixes would include species that would not exceed 6 inches in height.

- Roads and pipelines should be designed to minimize the amount of disturbance to suitable plover habitat.

- Stopping and getting out of vehicles along roadways would not be allowed in suitable mountain plover habitat during the breeding and nesting period (April 10 to July 10) to prevent unnecessary disruption to mountain plover except in an emergency situation.

- Construction of structures that could be used for raptor perches should be avoided or mitigated to prevent raptor perching.

4.7.1.5 BLM SENSITIVE SPECIES

Direct and indirect effects on BLM sensitive species could occur due to impact with vehicles, loss of habitat or displacement due to project activities. Due to the relatively small size of the project area, the inherent mobility of these species and the abundance of potentially suitable habitats nearby, there should be no noticeable adverse effects from the proposed development. Project activities would be conducted in accordance with committed measures outlined in this document.

4.7.1.5.1 MITIGATION

The project would be conducted with adherence to committed practices as detailed in Section 2.1.9.8, Chapter 2. Also see Section 4.7.1.2.1 for mitigation for protection of the greater sage-grouse.

Adoption of the following measures would further reduce potential impacts.

- Road maintenance on the access road leading to the North Sweetwater pod would not occur outside the area previously disturbed within the existing white-tailed prairie dog town.

- Kennedy could adopt a policy restricting firearms and dogs at work locations.

4.7.1.7 MIGRATORY BIRDS

Migratory bird species nesting in the area may suffer habitat loss through shrub removal or could collide with vehicle traffic. The proposed activity may benefit some species of birds which feed on weed seeds (i.e., Horned Larks). Produced water could prove toxic to birds if levels of certain elements (i.e., sodium) were present in high concentrations. Kennedy has agreed to net reserve pits if sodium levels exceed 17,000 ppm. Seasonal restrictions stipulated for raptor and mountain plover protection should minimize adverse impacts to those species. These time limitation stipulations for construction should also benefit migratory bird species which use the project area.

4.7.1.7.1 MITIGATION

To further prevent impacts to migratory birds, the following measure could be adopted.

- All reserve pits would be netted prior to using the pits to store produced water if water quality testing shows water quality to be toxic to migratory birds. Toxicity levels would be determined using FWS' guidelines (i.e., selenium thresholds). Any netting would have a weave sufficiently small enough to prevent small migratory birds from entering the pits.

4.7.2 NO ACTION

Under the No Action Alternative, the development of the proposal would not occur. No additional effects on wildlife resources would be expected to occur beyond the current situation.

4.8 WILD HORSES

If the wild horse population found in the Great Divide Basin Wild Horse Herd Management Area were impacted to the extent that wild horse populations were reduced to well below the low-end of the appropriate management level identified in the GRRMP could be considered significant.

4.8.1 PROPOSED ACTION

Some forage loss is expected due to development. Although wild horses are accustomed to vehicles, traffic, and other human activity, vehicle/horse collisions could occur if traffic speeds are not kept to a minimum and the right of way is not given to the wild horses especially if drilling activity occurs at night. Temporary displacement of wild horses during construction may increase use on areas outside the project area. Horse gathers may occur within or around the project but should not conflict with the Proposed Action.

4.8.2 MITIGATION

The Proposed Action would adhere to committed practices as detailed in Chapter 2.

Application of the following mitigation would further reduce potential impacts.

- Wild horses would be given the right of way and reduced speed limits should be implemented especially if work is done at night.

4.8.3 NO ACTION

Under the No Action Alternative, the development of the Proposed Action would not occur. No additional effects on wild horses would be expected to occur beyond the current situation.

4.9 RECREATION

Any impact that would eliminate recreational opportunities in the Red Desert Watershed Area could be considered significant.

4.9.1 PROPOSED ACTION

Due to the abundance of nearby similar recreational opportunities for hunting, camping, and off-highway vehicle use, no noticeable effects on recreational experiences are expected under the project. Impact to the recreation use of the project area would involve a temporary displacement of some hunters, particularly if construction and drilling activities were to occur during hunting season. Some hunters perceive these activities as displacing game species and creating an environment that detracts from the hunting experience. The proposed drilling schedule could limit displacement to one season. Hunters could easily relocate to other areas outside the project area.

Undisturbed landscapes, isolation, and solitude are often important to recreationists. Project-related disturbances that adversely impact the characteristic landscape could also contribute to a decline in the recreation experience for these users. The recreation experience for those continuing to use the area could be less satisfying than use under the pre-disturbance conditions described in Chapter 3.

The effects described above would diminish substantially once drilling and construction are completed. However, they would persist at reduced levels. Overall effects on the recreation resource would be minimal due to the short-term nature of drilling and construction activities, and concentrated locations of activities.

4.9.2 MITIGATION

No mitigation is identified.

4.9.3 NO ACTION

Under the No Action Alternative, the development of the Proposed Action would not occur. No additional effects on recreation resources would be expected to occur beyond the current situation.

4.10 VISUAL RESOURCES

Impacts that would result in a change to the existing visual classification (Class III) or that would prevent a casual observer the opportunity of seeing areas with unobstructed views (from key observation points) could be considered significant.

4.10.1 PROPOSED ACTION

As noted in Chapter 3, Affected Environment, the project area is not pristine. Developed roads and

two-track roads exist throughout the area, and are used by ranchers, recreationists and mineral developers. No effects on the existing visual resource management class (Class III) are expected under the Proposed Action.

Digital analysis of key observation points, a 10-mile section of County Road 4-21 adjacent to the project area, was constructed using ArcView 3.2 with Spatial Analyst. Vertices were selected along the road at 100-yard intervals. The height of the casual observer was set at 1.524 meters (5 feet). Height of the observed was set at 0.0 meters (ground level). The outside distance was set at 8046.72 meters (5 miles or outer edge of the foreground of the viewing area). The computer generated results can be found on Figure 4.1. It should be noted that using this technique to conduct a settings analysis does not take into account the screening effect of vegetation. In addition, the areas shown as visible on Figure 4.1 are visible from some point along the travel way.

Short-term impacts to the visual resource associated with construction and drilling in the project area would include contrasts in line, form, color, and texture associated with drilling rigs, construction equipment, service trailers, and the general industrial character of drilling and testing activities. Additional impacts could occur from fugitive dust produced by construction activities. Thus, any impacts to the Class III viewshed would be temporary and considered necessary and due. Use of low-contrast, non-reflective paint and natural colors on structures would reduce the visual impacts to the extent possible and be in accordance with the GRRMP management actions for the Red Desert Watershed Management Area.. BLM approved colors would be used on any temporary (i.e., tanks) or permanent structures (i.e., wellhead covers) in accordance with the GRRMP.

Additional fixed facilities such as access roads (improved and unimproved roads and overland routes) would be required to service production facilities. Roads would create additional contrasts in line, color and texture to those described above. With appropriate mitigation, the level of contrast would not exceed Class III standards. However, contrasts could diminish the experience of motorists and recreationists in the immediate area.

4.10.2 MITIGATION

No additional mitigation is identified.

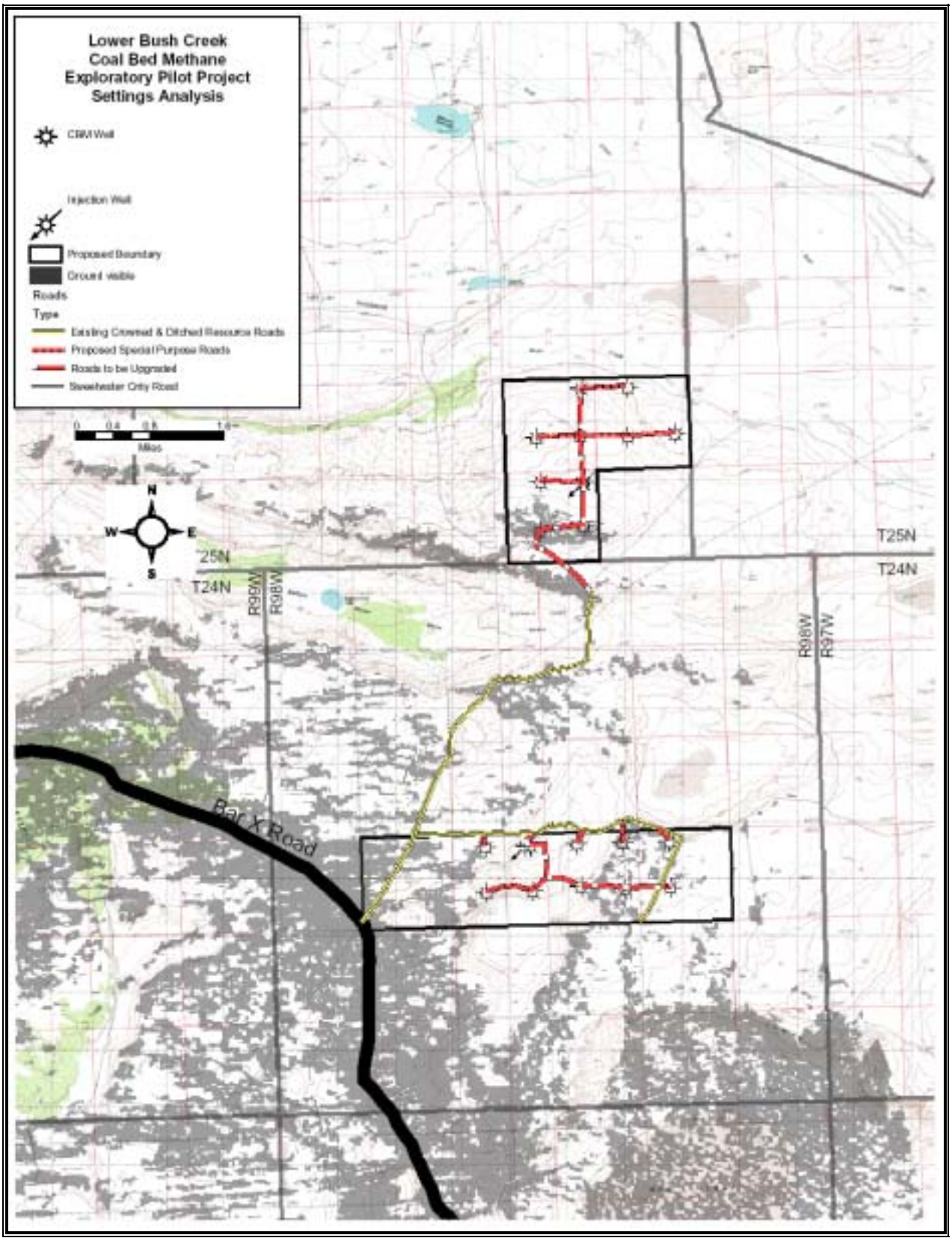
4.10.3 NO ACTION

Under the No Action Alternative, the development of the Proposed Action would not occur. No additional effects on recreation resources would be expected to occur beyond the current situation.

4.11 CULTURAL RESOURCES

If actions were to adversely affect a National Register eligible property and could not be mitigated, resulting in an adverse effect determination, the impact could be considered significant.

Figure 4.2 Viewshed Analysis of Project Area and Access



4.11.1 PROPOSED ACTION

Adverse effects to historic properties would be mitigated first by avoidance, then by other measures determined in consultation with the Wyoming State Historic Preservation Officer and affected Tribes as appropriate. Monitoring by a professional archaeologist of surface disturbing activity is useful to reduce to potential damage to cultural resources. Direct impacts would primarily result from construction related activities. Activities considered to have the greatest potential effect on cultural resources include blading of well pads and associated facilities and the construction of roads and pipelines. Sites located outside the project area would not be directly affected by the construction activities.

Some Class III surveys have been completed in the project area but others are yet to be fully completed. Identification of important sites prior to disturbance would minimize or eliminate impacts to important cultural resources. The likelihood exists that buried sites could be disturbed during construction. Indirect impacts to cultural sites not inventoried could be possible if unauthorized disturbances were to occur.

4.11.2 MITIGATION

Application of the mitigation identified below would minimize potential impacts to cultural resources.

- Individual cultural clearances would be approved prior to approving well APDs.

- All surface or vegetative disturbing activities associated with individual actions should monitored by a professional archaeologist.

- If at any time during construction, maintenance, or use of in the project area, previously unanticipated or unknown cultural resources are discovered, all activities would be suspended in the area of discovery. Continued operation would be conducted in such a fashion as to permit no further damage to the discovered cultural resource. Protective measures could be implemented in consultation with BLM and the Wyoming State Historic Preservation Office. Work would not resume in the area of discovery until a written Notice to Proceed is issued by BLM's authorized officer.

- Mitigation of effects to cultural resources would be determined through consultation between the BLM and the Wyoming State Historic Preservation Officer and affected Tribes as appropriate. Protective measures may be required to preserve significant cultural resources outside the direct impact zones as well.

4.11.3 NO ACTION

Under the No Action Alternative, the development of the Proposed Action would not occur. No additional effects on cultural resources would be expected to occur beyond the current situation.

4.12 SOCIOECONOMICS

Impacts that result in a major increase to the population base of Sweetwater or Carbon Counties or major increases in needed social services could be considered significant.

4.12.1 PROPOSED ACTION

The project could enhance local and regional economic conditions and could result in the generation of local, state, and federal government tax and royalty revenues should production prove successful and ensue. The relatively small, short-term drilling and testing operations workforce would not generate noticeable population effects or demand for temporary housing or local government services. Work camps (office, sleeping trailers) could be required. Should work camps be required, it would be authorized as separate action since exact locations are unknown at this time.

The proposal would involve capital investment. Development and operation of the project would require goods and services from a variety of local and regional contractors and vendors, from the oil and gas service industry and from other industries. Expenditures by the proponent for these goods and services, coupled with employee and contractor spending, would generate economic effects for Sweetwater and possibly Carbon Counties, and for Wyoming in the form of taxes collected.

It is reasonable to assume that the direct and indirect economic benefits of the project would be positive. It would be expected that if testing proves successful, additional development would be proposed. The extent of any future proposed development is unknown at this time.

4.12.2 MITIGATION

See Chapter 2, Section 2.1.19.10 for committed practices.

- Any work camps would be authorized separately.

4.12.3 NO ACTION

Under the No Action Alternative, the development of the proposed project would not occur. No federal mineral royalties or local taxes would be obtained from this project. No additional socioeconomic effects would be expected to occur beyond the current situation.

4.13 TRANSPORTATION

Impacts that result in major changes to traffic patterns on highways or county roads or cause severe damage to permitted roads or adjacent resources could be considered significant.

4.13.1 PROPOSED ACTION

The project would generate increases in traffic volumes on highways and county and management roads providing access to and within the project area. These increases would result from the movement of project-related workers, equipment and materials to and from the project area to perform drilling, field development, well service, field operations, and reclamation activities.

Table 2-2 shows the estimated average number of trips associated with various well field activities. According to information provided by the proponent, drill rigs, water trucks, and other items of heavy equipment would be transported to the project area and remain within the project area until drilling is completed. Materials and supplies would be delivered on a weekly basis and stockpiled within the project area. Drilling and completion crews and other personnel would commute to the area daily. Based on these plans and the estimates contained in the table, the project would generate between 5 and 20 round trips per day during drilling and testing operations. After the drilling and testing phase is completed and if production ensues, Proposed Action-related traffic would average one or two trips per day, with slightly higher peak periods when maintenance activities are performed on wells.

Given the relatively small increment of traffic and the relatively short duration of the drilling and testing phase, it is unlikely that the project would result in a measurable increase in accident rates on highways or county roads.

Use of "Special Purpose" roads to access well sites during drilling and year-round access during testing could result in unnecessary and undue resource damage (see Soils and Water sections above) or damage to equipment.

4.13.2 MITIGATION

See mitigation sections for Soils and Water Resources for suggested mitigation for special purpose and resource roads.

4.13.3 NO ACTION

Under the No Action Alternative, the development of the Proposed Action would not occur. No additional transportation effects would be expected to occur beyond the current situation.

4.14 HEALTH AND SAFETY

Impacts due to intentional violation of standards or regulations pertaining to worker safety could be considered significant.

4.14.1 PROPOSED ACTION

Health and safety impacts of the project would include a relatively low risk to project workers from

industrial accidents, and natural disasters. There would be a slight increase in risk of traffic accidents during drilling and field development, and during field operations, particularly if "Special Purpose" roads were to be used.

Occupational Hazards

During the drilling and field development phase of the project the probability of injuries is low. The BLM, WOGCC, WDEQ, OSHA, and USDOT each regulate certain safety aspects of oil and gas development. Adherence to relevant safety regulations on the part of the proponent and enforcement by the respective agencies would reduce the probability of accidents. Additionally, given the remote nature of the project area, and the relatively low use of these lands by others, occupational hazards associated with the project would mainly be limited to employees and contractors rather than the public at large. Any cumulative impacts are limited to the analysis area.

Other Risks and Hazards

The risks to public health and safety are not expected to increase under the Proposed Action. Highway safety impacts are discussed under Transportation section. Sanitation impacts would be avoided or reduced by the implementation of the mitigation measures outlined in Chapter 2.

4.14.2 MITIGATION

See mitigation sections for Soils and Water Resources for suggested mitigation for special purpose roads.

4.14.3 NO ACTION

Under the No Action Alternative, the development of the Proposed Action would not occur. No additional effects on public health or safety would be expected to occur beyond the current situation.

4.15 HAZARDOUS MATERIALS

Intentional violation of any Federal or State regulation pertaining to the use, storage, transportation or disposal could be considered significant.

4.15.1 PROPOSED ACTION

Kennedy Oil would handle materials used for drilling as described in Section 2.1.9.6, Chapter 2 and Appendix D. Thus, any impacts would be expected to minor, especially if proper handling and use of such materials on the well site occurs. Placement of well locations away from drainages, proper cementing operations, properly designed reserve pits and on-site storage areas would keep any accidental spills or leaks localized. Prompt clean up would prevent further contamination of soils, surface or ground water. Project operations would comply with all relevant federal and state laws regarding hazardous wastes or materials and with directives identified in the SPCC plan.

Kennedy proposes to use drilling mud for road plating. Use of drilling mud for plating or mixing with soil for road surfacing is cause for concern. The BLM RSFO has not allowed the use of drilling mud for road plating or surfacing; thus, the impacts of constructing roads with drilling mud possibly containing additives is unknown.

4.15.2 MITIGATION

- A stipulation preventing use of drilling mud for road construction should be adopted.

4.15. 3 NO ACTION

Under the No Action Alternative, potential for spills or leaks would not exist since drilling activity would be denied. However, selection of this alternative would not prevent future drilling proposals or the potential for spills or leaks from other activities (e.g., recreational vehicle use, on-going oil and gas activities).

4.16 NOISE

No significance criteria has been established for noise since drilling activity would be short term (10 days/well), no residences are nearby (closest residence is approximately 8 miles away), and a threshold for noise has not been identified by the State of Wyoming.

4.16.1 PROPOSED ACTION

Noise associated with construction and natural gas production operations can create a disturbance that affects human safety (at extreme levels) or comfort as well as modify animal behavior. Determining activities that exceed the maximum standards is not a simple issue since perception of sound varies with intensity and pitch of the source, air density, humidity, wind direction, screening/focusing by topography or vegetation, and distance to the observer. Noise levels in excess of the 55 dBA standard (EPA standard) would occur during construction and drilling operations. Construction-related effects would be short term.

Given the low human population densities in the project area, construction and development operations under the alternatives would be sufficiently distant from residences that none would likely be affected by construction or development operations. Overall noise produced by construction and support services equipment during peak activity periods would be moderate because of its dispersed and short-term nature.

4.16.2 MITIGATION

See committed practices detailed in Chapter 2, Section 2.1.9.4.

4.16.3 NO ACTION

Under the No Action Alternative, the Proposed Action would not advance.

4.17 CUMULATIVE IMPACTS

Cumulative impacts are those that would result from the incremental impacts of the proposed project added to past, present, and reasonably foreseeable development (RFD). Cumulative impact assessment areas (CIAAs) vary among resources and are generally based on relevant landscape, resource, project, and/or jurisdictional boundaries. The CIAA for individual resources affected by this action is found below.

Resource	Cumulative Impact Assessment Area	Number of Acres of Disturbance or Activity Level	Potential Cumulative Impacts from Lower Bush Creek Project
Air Quality	Regional airshed including portions of Wyoming, northern Colorado, and northeastern Utah		Emissions within the federal and state thresholds
Geology/Mineral/ Paleontological Resources	Geology/Paleontological Resources: project area + 2 miles; 33,280 acres	Approximately 9 miles (44 acres) of existing road	Proposed Action of 22 wells (including injection wells) initially disturbing 101.94 acres (63.38 acres should production occur) and RFD of 7 wells within the vicinity of the project area resulting in 25.28 acres of disturbance. Known proposed development of 11 wells in the Rawlins Field Office[2] (39.6 acres)
	Mineral Resources: A portion of the "General and Mineral Cumulative Impact Assessment Areas" for the CD/WII[2] (see Figures 3.3 & 4.1). 175,760 acres within the Red Desert Watershed Management Area outside of the Jack Morrow Hills planning area	Mineral Resources Approximately 90.00 acres disturbed (25 wells) and 15 miles Co Rd 4-21, approximately 17 miles of oil/gas road (82 acres disturbed)	
Soils/Vegetation/Invasive Species	Project Area + 2 mile buffer; 33,280 acres	Approximately 48 acres disturbed	Proposed Action of 22 wells (including injection wells) initially disturbing 101.94

2 Assumes activity occurring in the Rawlins Field Office is within the cumulative impact assessment prepared for the CD/WII project and has been fully implemented. Assumes all disturbances associated with the minerals cumulative impact assessment area for the CD/WII has been implemented. Assumed disturbance per well (all facilities) is 3.6 acres (CD/WII EIS cumulative assessment assumption).

Resource	Cumulative Impact Assessment Area	Number of Acres of Disturbance or Activity Level	Potential Cumulative Impacts from Lower Bush Creek Project
			acres (63.38 acres should production occur). No effect determination for Ute ladies' tresses (listed plant species) and RFD of 7 wells within the vicinity of the project area resulting in 25.28 acres of disturbance. Mitigation (stabilization, reclamation) required where soils are disturbed. Seeding with native species. Mitigation to prevent invasive species invasion/weed treatments required
Surface Water Resources	Affected watersheds Lower Bush Creek (38,954 acres), North Red Desert Basin 984,729 acres), Alkali Basin (40, 178 acres), Buffalo Hump Basin (25,516 acres); area within a closed basin - 189,377 Total Acres	Estimated acres of disturbance in Lower Bush Creek (196.2), North Red Desert Basin (337.8 acres), Alkali Basin (188.4 acres); Buffalo Hump (136 acres); 858.4 total disturbed acres[2]	Surface water not impacted by Proposed Action. Existing disturbance (858.4 acres), PA and RFD would add 141 acres of disturbance. Mitigation (avoidance/ protection) required for all activities on public land. Closed basin
Ground Water Resources	General Cumulative Impact Assessment Area for the CD/WII includes all or portions of the Great Divide Basin Watershed/Fort Union Formation; 4,490,000 acres	106,300 surface acres[3]	Proposed Action would move water from one horizon of the Fort Union to another. Impact localized and should production occur, further detailed study would be required. Proposed Action and RFD consumption of ground water by other actions is small compared to existing water supplies. Mitigation is required to prevent ground water contamination. Cumulative impact is expected to be within acceptable limits as outlined

Assumes 4.8 acres of disturbance per mile of road not associated with an individual well (i.e., collector road, GRRMP assumption).

3 Assumes all activity approved in the CD/WII project and general cumulative impact assessment area has been fully implemented.

Resource	Cumulative Impact Assessment Area	Number of Acres of Disturbance or Activity Level	Potential Cumulative Impacts from Lower Bush Creek Project
			in the CD/WII (1999c)
Noise	Project Area + 2 mile buffer; 33,280 acres	1 producing well, 2 wells shut in, and 3 APDs (approved or under review)	The Proposed Action and RFD would not add to the existing level of noise (drilling is a temporary activity and would not occur at once - testing/production results in minor increases to existing background noise levels)
Land Use/Range Resources	Red Desert Allotment - 260,584 acres; 11,331 AUMs	1740 acres disturbed or 76 AUMs[3]	Proposed Action and RFD would add 127.22 acres of disturbance or 8 AUMs
Pronghorn Antelope	Portion of the Red Desert Herd Unit overlapping the general cumulative impact assessment area for CD/WII <u>Crucial Winter/yearlong;</u> 272,704 acres; <u>Winter/ yearlong;</u> 1,849,024 acres	<u>Crucial Winter/yearlong</u> 14,234 acres of disturbance[3] <u>Winter/yearlong -</u> 23,637 acres of disturbance[3]	Proposed Action and RFD would add 127.22 acres of disturbance to winter/yearlong habitat
Mule Deer	Portion of the Steamboat Mule Deer Herd Unit overlapping the general cumulative impact assessment area for CD/WII <u>Winter/yearlong;</u> 642,688 acres	8,600 acres of disturbance[3]	No suitable habitat occurs in the project area; Proposed Action and RFD would add 0 acres of disturbance to winter/yearlong mule deer habitat
Elk	Portion of the Steamboat Elk Herd Unit overlapping the general cumulative impact assessment area for CD/WII <u>Crucial winter/yearlong;</u> 276,544 acres	<u>Crucial winter/yearlong</u> – 703 acres of disturbance[3] <u>Winter and winter/yearlong</u> – 5679 acres of	Crucial or winter/yearlong ranges not affected by Proposed Action; RFD could add 3.6 acres of disturbance winter/yearlong elk habitat

Resource	Cumulative Impact Assessment Area	Number of Acres of Disturbance or Activity Level	Potential Cumulative Impacts from Lower Bush Creek Project
	Winter and winter/yearlong; 438,656 acres	disturbance[3].	
Sage Grouse	Project area + 2 mile buffer within the Red Desert Upland Game Bird Management Area (containing probable nesting, 571,000 acres; potential breeding, 31,000 acres)	Approximately 12.5 miles of existing roads resulting in 60 acres of disturbance in potential nesting habitat	Proposed Action – 15 wells (90 acres disturbance) could be located within potential nesting habitat. Stipulations apply; RFD - Proposals handled on a case-by-case basis. Mitigation would apply
Raptors	Lower Bush Creek project area + 1 mile buffer; 16,000 acres	Existing road resulting in approximately 9.6 acres of disturbance	Proposed Action would add 0 acres of disturbance; RFD 2 wells (7.2 acres) could occur within 1 mile of ferruginous hawk nest. Timing stipulations would apply
Wild Horses	Great Divide WHHMA; 723,100 acres	cumulative disturbance of 19,000 acres	Proposed Action and RFD would add 127.22 acres of disturbance[3]
T&E	Black-footed ferret (within white-tailed prairie dog habitat), bald eagle, water depletions of the Platte River and Colorado River Basins, mountain plover		Proposed Action -No effect determination for black-footed ferret, bald eagle and water depletions. No jeopardy determination for mountain plover, mitigation applies. RFD -proposals handled on a case-by-case basis
Socioeconomics	Sweetwater & Carbon Counties		Continued employment opportunities; minor enhancement to local and state revenues; add to national energy supply
Cultural	Project area; 4,504 acres	Existing roads resulting in approximately 14 acres of disturbance	Proposed Action – no adverse effect determination; RFD - proposals handled on a case-by-case basis
Recreation	Project area + surrounding area	Mainly hunting related activities, some ORV use	Some temporary displacement of hunters and recreationists during periods of drilling and construction.

Resource	Cumulative Impact Assessment Area	Number of Acres of Disturbance or Activity Level	Potential Cumulative Impacts from Lower Bush Creek Project
			There may be reduced levels of satisfaction with the recreational experience but more vehicle access
Visual Resources	Project area + 10 mile section of access road leading to the project area; area within the Class III VRM	Existing and proposed oil and gas activity, roads, pipelines, and other intrusions	The area is not pristine. Existing, proposed, and RFD would add to the visual impact. However, all activity would be mitigated (placement, painted). Large areas of unobstructed views remain

Reasonably Foreseeable Development

Reasonably foreseeable development is that development likely to occur within the CIAA for this action. Known reasonably foreseeable developments include the Proposed Action and development of other exploratory and production wells in the vicinity (Figure 3.3). All development proposed on public lands is subject to compliance with NEPA including cumulative impact assessment. The CIAA for this action lies within the northwest portion of the General Cumulative Impact Assessment Area for the CD/WII project (Figure 4.1).

Past actions on or in the vicinity of the project area that continue today and have major influences on the area include on-going natural gas exploration and development, livestock grazing, wild horse management, recreation, and use by wildlife and wild horses.

Air Quality

The Continental Divide/Wamsutter II air quality study (1999c) demonstrated that both short- and long-term total predicted TSP, PM_{10}, SO_2, CO, volatile organic compounds (VOC), hazardous air pollutants (HAPs), and NO_2 concentrations would comply with applicable air quality standards (i.e., WAAQS and NAAQS) as a result of direct, indirect, and cumulative project emissions (including construction and operation). Analyses presented in the Pinedale Anticline air quality studies (1999a) also found that the predicted emissions from cumulative sources continue to be in compliance with the NAAQS and WAAQS for all pollutants. The latest air quality study which covers the same airshed region as the CD/WII and Pinedale studies, known as the Desolation Flats Natural Gas Field Development EIS (2003), also determined that emissions remain below applicable federal and state standards.

Topography, Soils, Surface Water, and Vegetation

Past, proposed, and reasonably foreseeable actions would require restoration of disturbed areas

to predisturbance conditions on public lands. Topographic alterations from natural gas exploration generally affect a very small portion of the total land surface (<1 % of the 175,760 acres found in the Red Desert Watershed Management Area located outside of the Jack Morrow Hills planning area).

The project area lies within a portion of the Red Desert Watershed Management Area of the Great Divide Basin. Existing facilities found in the Divide Basin include the UPRR, Interstate 80, County roads, and numerous upgraded roads and two track trails, well pads, pipelines4, powerlines, etc. All of these developments affect surface water quality to a small degree - run off from gravel and two-track roads probably contribute most to any surface water impacts. However, stormwater runoff control plans are required by federal, state, or county entities so cumulative impacts to surface water quality are expected to be within acceptable levels. Standard stipulations and site-specific construction and reclamation procedures are required on federal lands to maintain surface drainage patterns. Procedures require implementation of reclamation including regrading and re-contouring disturbed areas to approximate original conditions, re-establishing appropriate vegetative cover, protecting soils from erosion, and stabilizing reclaimed landscapes. These precautions minimize cumulative impacts to topography, soils, surface water, and vegetation. Weed control would be implemented as necessary.

Geologic Hazards, Ground Water, Noise and Odors, Land Use, Range, Health/Safety, Transportation, and Hazardous Materials

Cumulative impacts from geologic hazards and to ground water, noise and odor, hazardous materials, transportation, health/safety, landownership, and land use are within the thresholds identified in the discussion of impacts for this project and the general cumulative impact assessment area for the CD/WII project (see cumulative impact discussion for each resource). Should testing prove producible quantity of natural gas, further environmental analysis would be conducted to asses the impacts of a full field development scenario.

Minerals and Socioeconomics

The proposed project could result in a depletion of CBM resources in the area but would not interfere with the potential recovery of other minerals. Natural gas production including CBM development is considered a primary industry that is important to the economic well-being of Sweetwater and Carbon Counties, the State of Wyoming (increased revenues) and the U.S. (energy availability).

Cultural Resources

Disturbance and/or loss of unidentified sites or artifacts may add to the cumulative loss of information about our heritage in the project area and throughout the region if these resources are not identified, inventoried, and/or appropriately protected or mitigated. However, such losses are not expected since mitigation measures as identified for the proposal would be implemented. Any potential future development projects with federal involvement would require the same level of analysis and protection. In the absence of cultural resource clearances and/or other federally

4 All pipelines are reclaimed

mandated cultural resource protection measures on private lands, increased impacts to cultural resources may occur.

Paleontology

With the application of appropriate mitigation cumulative impacts similar to those of cultural resources are anticipated for paleontological resources. The likelihood of disturbing paleontological resources would remain low; however, any fossils uncovered during construction might not be mitigated on private lands in the same way they would be under the Proposed Action, resulting in a loss of those fossils. In addition, natural erosion and illegal collection would continue at current levels.

Wildlife

Impacts to big game species would be as described for the Proposed Action yet increased due to other on-going activities including developments occurring on private land where protective stipulations are not applied. Most other mammal and bird populations would similarly be affected primarily by natural forces, especially the weather. Project developments (e.g., wells, roads, and water injection pipeline) could impact management of greater sage-grouse and raptor habitat. However, protection of greater sage-grouse leks and nesting habitat and raptor nests on public land is strictly enforced and would be applied on future projects to ensure existing populations are maintained. The proposed project may contribute some additional impacts (e.g., habitat loss and increased human presence) to the cumulative effects on prairie dog habitat (including that which may support black-footed ferrets and other species such as the burrowing owl) from livestock grazing, oil and gas, recreational use, and vehicle traffic through habitat loss and increased access. Coordination and consultation with the FWS is conducted on a case-by-case basis.

Cumulative impacts to the local mountain plover population, primarily through habitat loss and displacement, as a result of past, proposed, and future projects are unknown. Disturbance due to livestock or wildlife use, oil and gas, recreation, vehicle traffic, and other uses has either removed, modified, or created potential mountain plover breeding and nesting habitat. Application of mitigation measures in accordance with FWS' guidelines should minimize impacts so that plover reproduction is not jeopardized.

Wild Horses

Wild horses are very tolerant of human activity and no cumulative impact is expected from the Proposed Action or RFD.

Visual Resources and Recreation

As mentioned, the viewshed is not pristine. However large areas of unobstructed views occur in the Red Desert watershed management area. Additional impacts to visual resources from future proposals could further alter the viewshed (i.e., well locations, roads, gas and water lines, gas

pipelines, and presence of dust) if not properly placed or disguised. Management prescriptions for the Red Desert require viewshed analysis for proposals on public lands and any impacts would be mitigated in order to meet the management objective of maintaining unobstructed views. Recreation is likely to continue at the same rate although some recreationists may not like the development and avoid the immediate area. Large areas of unobstructed views and open space remain.